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(FILE 'HOME' ENTERED AT 12:04:36 ON 12 SEP 2005)  
FILE 'CA' ENTERED AT 12:04:51 ON 12 SEP 2005  
L1 1467122 S (PARTICLE OR PARTICULATE OR COLLOID? OR NANOPART? OR NANOCRYST?  
OR NANOCLOUST? OR CLUSTER OR NANOASSEMB? OR NANONETWORK? OR  
NANOSCALAR)  
L2 11425 S L1 (7A) (THIOL? OR ALKANETHIOL? OR ALKYLTHIOL? OR MERCAP? OR  
AMIN?)  
L3 26463 S L1 (6A) (STABILIZ? OR STABILIS? OR SELF ASSEMLB? OR PASSIVAT? OR  
PROTECT?)  
L4 1359 S L2 AND L3  
L5 824 S L4 AND (COPPER OR CU OR GOLD OR AU OR SILVER OR AG OR PLATINUM OR  
PT OR PALLADIUM OR PD)  
L6 3332 S L3 (7A) (COPPER OR CU OR GOLD OR AU OR SILVER OR AG OR PLATINUM OR  
PT OR PALLADIUM OR PD)  
L7 163 S L1 (7A) (DITHIOL? OR ALKYLDITHIOL? OR ALKYLENEDITHIOL? OR  
ALKENEDITHIOL? OR ALKYLENETHIOL? OR ALKENETHIOL? OR (ALKYL OR  
ALKYLENE OR ALKENE) (2A) DITHIOL?)  
L8 24 S L4 AND L7  
L9 32 S L7 (10A) (LINK? OR SUBSTITUT? OR REPLAC? OR EXCHANG? OR DISPLAC?  
OR BIFUNCTION? OR DIFUNCTION? OR HETEROFUNCT?)  
L10 258 S L4 NOT PY>1997  
L11 74 S L5 AND L10  
L12 37 S L4 NOT L10 AND PATENT/DT AND PY<1999  
L13 1076 S L6 NOT PY>1997  
L14 1020 S L13 NOT L8-9,L11  
L15 6 S L14 AND (DITHIOL? OR ALKYLDITHIOL? OR ALKYLENEDITHIOL? OR  
ALKENEDITHIOL? OR ALKYLENETHIOL? OR ALKENETHIOL? OR (ALKYL OR  
ALKYLENE OR ALKENE) (2A) DITHIOL?)  
L16 65 S L14 AND (THIOL? OR MERCAP? OR AMIN?)  
L17 23 S L10 AND (DIMENSION? OR BIFUNCTION? OR DIFUNCTION?)  
L18 152 S L8-9,L11,L15-17 NOT PY>1998  
L19 189 S L12,L18

=> d bib,ab 119 1-189

L19 ANSWER 24 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 128:209367 CA  
TI Self assembly of nanosized gold clusters into regular arrays  
AU Fink, J.; Kiely, C. J.; Bethell, D.; Schiffrin, D. J.  
CS Department of Materials Science and Engineering, University of  
Liverpool, Merseyside, L69 3BX, UK  
SO Institute of Physics Conference Series (1997), 153 (Electron Microscopy  
and Analysis 1997), 601-604  
AB Stable solns. of un-derivatized and thiol-derivatized nano-sized Au  
colloids in toluene were prep'd. A drop of the colloidal soln. when  
allowed to evap. onto a C grid, forms self-assembled superstructures  
which were examd. with transition electron microscopy. In monolayer  
form, the Au particles assemble into highly ordered pseudo-hcp. rafts in  
which the interparticle sepn. can be controlled by varying the size of  
the stabilizing species attached to the Au surface. When allowed to  
form bilayers, the Au particles adopt corrugated chain- and ring-like  
structures in addn. to normal, close-packed stacking sequences.

Possible origins of these unusual stacking phenomena are discussed.

L19 ANSWER 27 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 128:96021 CA

TI Layer-by-layer **self-assembly** of composite films of CdS **nanoparticle** and alkanedithiol on **gold**: an x-ray photoelectron spectroscopic characterization

AU Nakanishi, Takuya; Ohtani, Bunsho; Shimazu, Katsuaki; Uosaki, Kohei  
CS Graduate School of Science, Division of Chemistry, Physical Chemistry  
Laboratory, Hokkaido University, Sapporo 060, Japan

SO Chemical Physics Letters (1997), 278(4,5,6), 233-237

AB Layer-by-layer self-assembly of composite thin films of Cd sulfide (CdS) nanoparticle and alkanedithiol was achieved on a Au substrate by an alternate immersion into solns. of **dithiols** (1,6-hexanedithiol and 1,10-decanedithiol) and soln. contg. CdS nanoparticles (~3 nm in diam.). The layer-by-layer structure was confirmed by angle-resolved XPS at each composite-film prepns. step. The proposed structure and mechanism of self-assembly were in agreement with previous results obtained by FTIR reflection-absorption spectroscopy.

$\alpha\beta$ L19 ANSWER 35 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 127:311752 CA

TI Poly-hetero- $\omega$ -functionalized **Alkanethiolate-Stabilized Gold Cluster Compounds**

AU Ingram, Roychelle S.; Hostetler, Michael J.; Murray, Royce W.

CS Kenan Laboratories of Chemistry, University of North Carolina, Chapel Hill, NC, 27599-3290, USA

SO Journal of the American Chemical Society (1997), 119(39), 9175-9178

AB This paper describes two synthetic approaches, simultaneous and stepwise exchange, to poly-hetero- $\omega$ -functionalized monolayer-**protected cluster compds.** (MPC's), as well their spectroscopic and electrochem. characterization. Poly-hetero- $\omega$ -functionalization of MPC's provides a framework within which to study intra- and intermol. cluster chem. and to design multistep, mutually supporting catalytic and electron donor/acceptor reactions on cluster surfaces. Factors affecting the extent of exchange (measured by NMR) include the steric bulk of the  $\omega$ -functional group as well as the chain lengths of the protecting and incoming ligands. Poly-hetero- $\omega$ -functionalized clusters can incorporate mixed redox functions as illustrated by microelectrode voltammetry of a poly-ferrocene/anthraquinone mixed cluster. The cluster voltammetric waves lie at potentials consistent with those obsd. in dil. solns. of the unbound electroactive thiols, within the uncertainty of the Ag quasi-ref. electrode. Diffusion coeffs. and hydrodynamic radii suggest that the outer parts of the cluster chains may be free-draining. This research demonstrates that **3-dimensional-SAMs** with mixed  $\omega$ -functionalized alkanethiolate ligands (both redox and nonredox active) can be synthesized and characterized and provides the groundwork for synthesis of nanofactory cluster compds. designed to exhibit mutually supporting, multistep chem. and redox catalytic reactions and for an enhanced capacity to study functional group reactivities at organized monolayer interfaces.

L19 ANSWER 45 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 127:56309 CA  
TI Preparation of Functional Silane-Stabilized Gold Colloids in the (Sub)nanometer Size Range  
AU Buining, Paul A.; Humbel, Bruno M.; Philipse, Albert P.; Verkleij, Arie J.  
CS Department of Molecular Cell Biology, University of Utrecht, Utrecht, 3584 CH, Neth.  
SO Langmuir (1997), 13(15), 3921-3926  
AB A synthesis method is introduced for very small uniform **Au** particles (diam. <5 nm), based on the redn. of H tetrachloroaurate(III) in EtOH in the presence of ( $\gamma$ -mercaptopropyl)trimethoxysilane (MPS). The surface layer of MPS mols. gives the **Au** particles a high colloidal stability and allows in principle further reaction with any silane coupling agent. Decrease of the HAuCl<sub>4</sub>:MPS ratio allows a controlled redn. of **Au** particle size, resulting in remarkably uniform **Au** clusters of (sub)nm size, obsd. with high-angle-annular-dark-field scanning TEM. After attachment of ( $\gamma$ -aminopropyl)triethoxysilane (APS) to the MPS surface layer, other mols. may be covalently bound to the **Au colloid** via the **amine** group of APS. As an illustrative example, we prep'd. in this manner **Au** particles labeled with a fluorescent dye. The chem. structure of the surface silanes was studied with FTIR spectroscopy.

L19 ANSWER 57 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 126:136128 CA  
TI Adsorption of Surface-Modified Colloidal Gold Particles onto Self-Assembled Monolayers: A Model System for the Study of Interactions of Colloidal Particles and Organic Surfaces  
AU Fan, Hongyou; Lopez, Gabriel P.  
CS Department of Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, NM, 87131, USA  
SO Langmuir (1997), 13(2), 119-121  
AB Self-assembled monolayers (SAMs) were formed from  $\omega$ -substituted alkanethiols, e.g. (1-mercaptoundec-11-yl)hexa(ethylene glycol) (HS(CH<sub>2</sub>)<sub>11</sub>-(OCH<sub>2</sub>CH<sub>2</sub>)<sub>6</sub>OH) and 1-dodecanethiol (HS(CH<sub>2</sub>)<sub>11</sub>CH<sub>3</sub>), on the surface of planar **Au** films and on colloidal **Au** particles. A quant. method for studying the phys. adsorption of SAM-modified **Au** colloids on the planar SAMs was developed. XPS and SEM were used to measure the compn. of planar SAMs and to quantify the extent of colloidal adsorption, resp. Results confirm that the colloids studied adsorb from the aq. soln. more extensively to hydrophobic surfaces, that the extent of adsorption increases with particle hydrophobicity, and that oligo(ethylene glycol) surfaces are resistant to colloidal adsorption. Colloidal **Au** particles and flat **Au** substrates modified with SAMs form a convenient and versatile model system for examg. existing theor. models assocd. with the adsorption of colloids and proteins, and cellular attachment and adhesion at solid surfaces.

L19 ANSWER 62 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 126:109247 CA  
TI Pressure/Temperature Phase Diagrams and Superlattices of Organically Functionalized Metal Nanocrystal Monolayers: The Influence of Particle

AU Size, Size Distribution, and Surface Passivant  
AU Heath, James R.; Knobler, Charles M.; Leff, Daniel V.  
CS Department of Chemistry and Biochemistry, UCLA, Los Angeles, CA, 90095-  
156905, USA  
SO Journal of Physical Chemistry B (1997), 101(2), 189-197  
AB The phase behavior of organically passivated 20-75 Å diam. Ag and Au  
nanocrystals was studied by examg. surface-area isotherms of Langmuir  
monolayers and transmission electron micrographs of Langmuir-Blodgett  
(LB) films. The effects of temp., org. passivant chain length, and  
nanocrystal size and compn. were studied. Three distinct types of phase  
behavior are obsd. which may be classified in terms of the extra  
(conical) vol. ( $V_e$ ) available to the alkyl capping group as it extends  
from a nearly spherical metal core. For  $V_e > 350 \text{ \AA}^3$ , the phase diagram  
is dominated by extended, low-dimensional structures that, at high  
pressures, compress into a 2-dimensional foamlike phase. This behavior  
is rationalized as originating from the interpenetration of the ligand  
shells of adjacent particles. For  $V_e < 350 \text{ \AA}^3$ , dispersion attraction  
between the metal cores dominate particle condensation. For  $350 \text{ \AA}^3 > V_e > 150 \text{ \AA}^3$ , the particles condense to form closest packed structures,  
which, for sufficiently narrow particle size distributions, are  
characterized by cryst. phases. For  $V_e \approx 30 \text{ \AA}^3$ , the particles  
irreversibly aggregate into structures similar to those expected from a  
diffusion-limited-aggregation model. Optical properties of certain LB  
films of the closest packed phases are reported.

αβL19 ANSWER 69 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 125:291641 CA  
TI Self-assembly of a two-dimensional superlattice of molecularly linked  
metal clusters  
AU Andres, Ronald P.; Bielefeld, Jeffery D.; Henderson, Jason I.; Janes,  
David B.; Kolagunta, Venkat R.; Kubiak, Clifford P.; Mahoney, William  
J.; Osifchin, Richard G.  
CS School Chemical Engineering, Purdue Univ., West Lafayette, IN, 47907,  
USA  
SO Science (Washington, D. C.) (1996), 273(5282), 1690-1693  
AB Close-packed planar arrays of nanometer-diam. gold clusters that are  
covalently linked to each other by rigid, double-ended org. mols. were  
self-assembled. Au nanocrystals, each encapsulated by a monolayer of  
alkyl thiol mols., were cast from a colloidal soln. onto a flat  
substrate to form a close-packed cluster monolayer. Org. interconnects  
(aryl dithiols or aryl diisonitriles) displaced the alkyl thiol mols.  
and covalently linked adjacent clusters in the monolayer to form a two-  
dimensional superlattice of metal quantum dots coupled by uniform tunnel  
junctions. Elec. conductance through such a superlattice of 3.7-nm-  
diam. Au clusters, deposited on a SiO<sub>2</sub> substrate in the gap between two  
Au contacts and linked by an aryl di-isocyanophenylethylnyl)-2-ethylbenene], exhibited nonlinear Coulomb  
charging behavior.

L19 ANSWER 72 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 125:178469 CA  
TI Nanocrystal gold molecules  
AU Whetten, Robert L.; Khouri, Joseph T.; Alvarez, Marcos M.; Murthy,

- Srihari; Vezmar, Igor; Wang, Z. L.; Stephens, Peter W.; Cleveland, Charles L.; Luedtke, W. D.; Landman, Uzi  
CS Sch. Phys. Chem., Georgia Inst. Technol., Atlanta, GA, 30332, USA  
SO Advanced Materials (Weinheim, Germany) (1996), 8(5), 428-33  
AB **Au nanocrystals passivated by self-assembled monolayers of straight-chain alkylthiolate mols.** were obtained as highly purified mol. materials of high intrinsic stability. Evidence is presented for a predicted discrete sequence of energetically optimal fcc. structures of a truncated octahedral morphol. motif. The nanocrystal materials have a propensity to form extended superlattices.
- L19 ANSWER 75 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 125:152018 CA  
TI Molecular Self-Assembly of Aliphatic Thiols on Gold Colloids  
AU Weisbecker, Carl S.; Merritt, Margaret V.; Whitesides, George M.  
CS Chemistry Department, Harvard University, Cambridge, MA, 02138, USA  
SO Langmuir (1996), 12(16), 3763-3772  
AB **Self-assembled monolayers (SAMs)** were formed on **Au colloids** in 50% aq. EtOH in the presence of alkanethiols ( $\text{HS}(\text{CH}_2)_n\text{R}$ , where R represents a series of neutral and acidic functional groups). Chemisorption of **alkanethiols** on the **Au colloids** significantly changes the rates of flocculation of the **Au** dispersions; the magnitudes of these pH-dependent changes are a function of chain length (n) and the terminal functionality (R) in a manner consistent with formation of SAMs on the colloid surface. The reduced rate of dissoln. of **alkanethiol-treated colloids** by wet chem. etchants, TEM, and XPS data further support the formation of SAMs.
- L19 ANSWER 76 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 125:151912 CA  
TI Highly Oriented Molecular Ag Nanocrystal Arrays  
AU Harfenist, Steven A.; Wang, Z. L.; Alvarez, Marcos M.; Vezmar, Igor; Whetten, Robert L.  
CS School of Physics, Georgia Institute of Technology, Atlanta, GA, 30332-0430, USA  
SO Journal of Physical Chemistry (1996), 100(33), 13904-13910  
AB Orientational ordering of faceted nanocrystals in nanocrystal arrays was obsd. directly for the 1st time (using TEM imaging and diffraction to resolve the structure of thin mol.-cryst. films of **Ag nanocrystals passivated by alkylthiolate self-assembled monolayers**). The type of ordering is detd. by the nanocrystal faceted morphol., as mediated by the interactions of surfactant groups tethered to the facets on neighboring nanocrystals. Orientational ordering is crucial for the understanding of the fundamental properties of quantum-dot arrays, as well as for their optimal utilization in optical and electronic applications.
- L19 ANSWER 81 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 125:124551 CA  
TI Room temperature Coulomb blockade and Coulomb staircase from self-assembled nanostructures  
AU Andres, R. P.; Datta, S.; Dorogi, M.; Gomez, J.; Henderson, J. I.; Janes, D. B.; Kolagunta, V. R.; Kubiak, C. P.; Mahoney, W.; et al.

CS Sch. CChem. Eng., Purdue Univ., West Lafayette, IN, 47907, USA  
SO Journal of Vacuum Science & Technology, A: Vacuum, Surfaces, and Films  
(1996), 14(3, Pt. 1), 1178-1183  
AB The **self-assembly** of well-characterized, nanometer-size **Au clusters** into ordered monolayer arrays spanning several microns was achieved. Techniques to insert mol. wires to link adjacent **clusters** in the **self-assembled** array were developed. "Unit cell" nanostructures formed from individual **Au clusters** supported on a **self-assembled** monolayer film of the double-ended thiol mol. p-xylene- $\alpha,\alpha'$ -dithiol show evidence for reproducible single electron effects at room temp. when studied by STM. Ests. for the elec. resistance of a single mol. can be obtained from these measurements. The exptl. values for this resistance are in reasonable agreement with theor. calcns. by using the Landauer approach.

αβL19 ANSWER 83 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 125:98169 CA  
TI From monolayers to nanostructured materials: an organic chemist's view of self-assembly  
AU Bethell, D.; Brust, M.; Schiffrian, D. J.; Kiely, C.  
CS Department of Chemistry, University of Liverpool, PO Box 147, Liverpool,  
L69 3BX, UK  
SO Journal of Electroanalytical Chemistry (1996), 409(1-2), 137-143  
AB Simple methods are described for the prodn. of **Au nanoparticles** with narrow size distributions by redn. of tetrachloroaurate solns. in the presence of thiol-contg. org. compds. which self-assemble on the **Au** surface. Stable solns. of somewhat larger **particles** can be produced if the **thiol** is absent. The thiol-derivatized materials are stable in air over long periods and can be handled in much the same way as simple org. compds. Using dithiols as the derivatizing spacer units, methods were developed for the prepn. of materials in 3-dimensional form and as thin films attached to a solid substrate. Such materials show conductivities that mimic the behavior of semiconductors and that depend markedly on the structure of the **dithiol** used to link the **Au particles** together. The increase in cond. with increasing temp. probably involves activated electron hopping from particle to particle. Surfaces treated with a coating of the materials show electroreflectance changes with applied potential that also differ according to the structure of the dithiol spacer. Unusual effects were obsd. on heterogeneous electron transfer from electrode surfaces treated with layers of the **Au nanoparticles** and **dithiol** spacers. Applications for these nanostructured materials can be envisaged, which range from submicroelectronic devices and circuitry to elec. modification of the reflectance of glass. Such applications will require a multidisciplinary approach with a substantial org. chem. research input.

L19 ANSWER 84 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 125:45892 CA  
TI "Coulomb staircase" at room temperature in a self-assembled molecular nanostructure  
AU Andres, Ronald P.; Bein, Thomas; Dorogi, Matt; Feng, Sue; Henderson, Jason I.; Kubiak, Clifford P.; Mahoney, William; Osifchin, Richard G.; Reifenberger, R.  
CS Sch. Chem. Eng., Purdue Univ., West Lafayette, IN, 47907, USA

- SO Science (Washington, D. C.) (1996), 272(5266), 1323-1325
- AB Double-ended aryl **dithiols** [ $\alpha,\alpha'$ -xylyldithiol (XYL) and 4,4'-biphenyldithiol] formed self-assembled monolayers (SAMs) on gold(111) substrates and were used to tether nanometer-sized gold clusters deposited from a cluster beam. An ultrahigh-vacuum scanning tunneling microscope was used to image these nanostructures and to measure their current-voltage characteristics as a function of the sepn. between the probe tip and the metal cluster. At room temp., when the tip was positioned over a cluster bonded to the XYL SAM, the current-voltage data showed "Coulomb staircase" behavior. These data are in good agreement with semiclassical predictions for correlated single-electron tunneling and permit estn. of the elec. resistance of a single XYL mol. ( $\sim 18 \pm 12 \text{ M}\Omega$ ).
- L19 ANSWER 87 OF 189 CA COPYRIGHT 2005 ACS on STN
- AN 124:300856 CA
- TI Monolayers in three dimensions: synthesis and electrochemistry of  $\omega$ -functionalized alkanethiolate-stabilized gold cluster compounds
- AU Hostetler, Michael J.; Green, Stephen J.; Stokes, Jennifer J.; Murray, Royce W.
- CS Kenan Laboratories of Chemistry, University of North Carolina, Chapel Hill, NC, 27599-3290, USA
- SO Journal of the American Chemical Society (1996), 118(17), 4212-13
- AB The synthesis and characterization of **Au cluster** compds. contg. a mixt. of **alkanethiolate** and  $\omega$ -substituted alkanethiolate ligands are reported. Cluster mols. prep'd. with **alkanethiolate** ligands, according to previous work, have a ~1.2 nm radius **Au** core that, modeled as a 309-**Au** atom cubooctahedron, bears a monolayer ligand skin of ~95 alkenethiolate chains. The  $\omega$ -functionalized clusters are synthesized by place exchange reactions in soln. mixts. of **alkanethiolate cluster** mols. and  $\omega$ -substituted **alkanethiols**, where the  $\omega$ -substituent can be -Br, -CN, vinyl, or ferrocenyl. The reaction products, according to  $^1\text{H}$  NMR spectroscopy, include cluster mols. with as many as 44 bromide and 15 ferrocenyl  $\omega$ -substituents. Steric  $\omega$ -substituent interactions appear to constrain the extent of place exchange. Ferrocenyl-substituted clusters are electroactive in  $\text{CH}_2\text{Cl}_2$  solns. as adsorbed monolayers and as diffusing solutes. The mass transport behavior indicates that as many as 15 ferrocene units in a substituted cluster mol. can be oxidized at an electrode surface over a potential range as narrow as that required to oxidize a ferrocene monomer, i.e., the cluster has promise as a reagent that delivers multiple equiv. of redox activity at nearly identical formal potentials. The **Au** cores of the clusters also exhibit "double layer" charging behavior and are thus true mol. "nanoelectrodes".
- L19 ANSWER 92 OF 189 CA COPYRIGHT 2005 ACS on STN
- AN 124:42310 CA
- TI Novel gold-**dithiol** nano-networks with non-metallic electronic properties
- AU Brust, Matias; Bethell, Donald; Schiffrin, David J.; Kiely, Christopher J.
- CS Dep. Chem., Univ. Liverpool, Liverpool, L69 3BX, UK
- SO Advanced Materials (Weinheim, Germany) (1995), 7(9), 795-7

AB Two new prepn. techniques are reported leading to composite materials, which comprise nanometer sizes Au particles self-assembled into a 3-dimensional network by org. dithiols. Au clusters with particle size of 2.2 nm were prepnd. in a 2-phase liq.-liq. system with di-Et ether as solvent and with 1,5-pentanedithiol, 1,6-hexanedithiole, and p-xylylenedithiole as stabilizing ligands. Colloids with a size of 8 nm were prepnd. using toluene as solvent without thiol and a subsequent reaction with the dithiols. The electronic properties are nonmetallic and adjustable via particle size and interparticle spacing depending on the dithiol.

αβL19 ANSWER 93 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 124:38546 CA

TI Monolayers in Three Dimensions: NMR, SAXS, Thermal, and Electron Hopping Studies of Alkanethiol Stabilized Gold Clusters

AU Terrill, Roger H.; Postlethwaite, Timothy A.; Chen, Chun-hsien; Poon, Chi-Duen; Terzis, Andreas; Chen, Aidi; Hutchison, James E.; Clark, Michael R.; Wignall, George; et al.

CS Kenan Laboratories of Chemistry, University of North Carolina, Chapel Hill, NC, 27599-3290, USA

SO Journal of the American Chemical Society (1995), 117(50), 12537-48

AB Au clusters stabilized by chemisorbed monolayers of octane-, dodecane-, or hexadecanethiolate were studied in soln. and in the solid phase. These materials can be pumped free of solvent to form a dark brown solid that can be re-dissolved in nonpolar solvents. Their exceptional stability suggests that they may be viewed as cluster compds. The self-assembled alkanethiolate monolayers stabilizing the metal clusters can be studied by using techniques that are insufficiently sensitive for study of a monolayer on a flat surface (e.g., <sup>1</sup>H and <sup>13</sup>C NMR, elemental anal., DSC, thermogravimetry (TGA), diffusion-ordered NMR spectroscopy (DOSY)). Results from such measurements (combined with SAXS data on solns. of the clusters and AFM and STM images) are consistent with a small, monodisperse (12 Å radius) Au core, which modeled as a sphere contains ~ 400 Au atoms and ~ 126 alkanethiolate chains, or if modeled as a cuboctahedral structure contains 309 Au atoms and ~ 95 alkanethiolate chains. High-resoln. NMR spectra of cluster solns. display well-defined resonances except for methylenes nearest the Au interface; the absence of the latter resonances is attributed to a combination of broadening mechanisms based on the discontinuous change in magnetic susceptibility at the metal-hydrocarbon interface and residual dipolar interactions. Films of the dry, solid cluster compd. on interdigitated array electrodes exhibit current-potential responses characteristic of electron hopping cond. in which electrons tunnel from Au core to Au core. The electron hopping rate decreases and the activation barrier increases systematically at longer alkane chain length. The results are consistent with electron transport rate control being a combination of thermally activated electron transfer to create oppositely charged Au cores (cermet theory) and distance-dependent tunneling ( $\beta = 1.2 \text{ Å}^{-1}$ ) through the oriented alkanethiolate layers sepg. them.

L19 ANSWER 98 OF 189 CA COPYRIGHT 2005 ACS on STN

AN 123:94218 CA  
TI Organization of Au Colloids as Monolayer Films onto ITO Glass Surfaces: Application of the Metal Colloid Films as Base Interfaces To Construct Redox-Active Monolayers  
AU Doron, Amihood; Katz, Eugenii; Willner, Itamar  
CS Institute of Chemistry, Hebrew University of Jerusalem, Jerusalem, 91904, Israel  
SO Langmuir (1995), 11(4), 1313-17  
AB Gold colloid films are organized on In Sn oxide (ITO) surfaces by using (aminopropyl)siloxane or (mercaptopropyl)siloxane as base monolayer for the deposition of the metal colloid. Different Au colloids (ranging in particles of diams. 25, 30, 35, and 120 nm) were deposited on the monolayer-modified ITO surfaces. For the small particles (25 nm), an almost continuous Au colloid film is formed with interparticle spacing of 10-25 nm. The surface coverage of the Au colloid on the (aminopropyl)siloxane monolayer is higher than that for the (mercaptopropyl)siloxane-modified ITO. The Au colloid films provide active surfaces for the self-assembly of redox-active thiolate monolayers. 8-(N-Methyl-4,4'-bipyridinyl)octanoic acid was covalently linked to a cystamine monolayer assembled on the Au colloids. For the 25 nm Au colloid, the surface coverage by the redox active unit ( $6.8 \times 10^{-10}$  mol cm $^{-2}$ ) is ~ 12-fold higher than that of the (aminopropyl)siloxane monolayer-modified ITO (lacking the Au film). The surface coverages of the Au colloid films by the bipyridinium monolayers increase as the colloid particle sizes decrease.

L19 ANSWER 99 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 123:18732 CA  
TI Self-assembled metal colloid monolayers: an approach to SERS substrates  
AU Freeman, R. Griffith; Grabar, Katherine C.; Allison, Keith J.; Bright, Robin M.; Davis, Jennifer A.; Guthrie, Andrea P.; Hommer, Michael B.; Jackson, Michael A.; Smith, Patrick C.; et al.  
CS Division Science, Northeast Missouri State University, Kirksville, MO, 63501, USA  
SO Science (Washington, D. C.) (1995), 267(5204), 1629-31  
AB The self-assembly of monodisperse Au and Ag colloid particles into monolayers on polymer-coated substrates yields macroscopic surfaces that are highly active for surface-enhanced Raman scattering (SERS). Particles are bound to the substrate through multiple bonds between the colloidal metal and functional groups on the polymer (e.g., cyanide (CN), amine (NH<sub>2</sub>), thiol (SH)). Surface evolution (which can be followed in real time by UV-visible spectroscopy and SERS) can be controlled to yield high reproducibility on both the nanometer and the centimeter scales. On conducting substrates, colloid monolayers are electrochem. addressable and behave like a collection of closely space microelectrodes. These favorable properties and the ease of monolayer construction suggest a widespread use for metal colloid-based substrates.

αβL19 ANSWER 100 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 122:323151 CA  
TI Preparation and Characterization of Au Colloid Monolayers  
AU Grabar, Katherine C.; Freeman, R. Griffith; Hommer, Michael B.; Natan,

Michael J.  
CS Department of Chemistry, Pennsylvania State University, University Park, PA, 16802, USA  
SO Analytical Chemistry (1995), 67(4), 735-43  
AB The design and initial characterization of 2-dimensional arrays of colloidal Au particles are reported. These surfaces are prep'd. by self-assembly of 12 nm diam. colloidal Au particles on immobilized polymers having pendant functional groups with high affinity for Au (i.e., CN, SH, NH<sub>2</sub>). The polymers are formed by condensation of functionalized alkoxy silanes on cleaned quartz, glass, and SiO<sub>2</sub> surfaces. The assembly protocol is carried out completely in soln.; cleaned substrates are immersed in methanolic solns. of organosilane, rinsed, and subsequently immersed in aq. colloidal Au solns. The 2-dimensional arrays form spontaneously on the polymer surface. The resulting substrates were characterized by UV-vis spectroscopy, TEM, and surface-enhanced Raman scattering (SERS). The TEM data show that the particles are sep'd. spatially, but are close enough to interact electromagnetically (small spacing compared to  $\lambda$ ). The UV-vis data show that collective particle surface plasmon modes are present in the 650-750 nm region, suggesting that these assemblies are SERS-active. This is indeed the case, with enhancement factors of roughly 104. The Au colloid monolayers possess a set of features that make them very attractive for both basic and applied uses, including uniform roughness, high stability, and biocompatibility.

L19 ANSWER 110 OF 189 CA COPYRIGHT 2005 ACS on STN  
AN 120:120414 CA  
TI Composite materials containing nanoscalar particles, process for producing them and their use for optical components  
IN Spanhel, Lubomir; Arpac, Ertugrul; Nass, Ruediger; Schmidt, Helmut  
PA Institut fuer Neue Materialien Gemeinnuetzige G.m.b.H., Germany  
SO PCT Int. Appl., 25 pp.  
PI WO 9307179 A2 19930415 WO 1992-EP2327 19921009  
US 5470910 A 19951128 US 1994-211431 19940628  
PRAI DE 1991-4133621 A 19911010  
AB The title materials are prep'd. by producing a stabilized sol. of nanoscale particles by reacting in an org. solvent (1) a sol. compd. of a metal from groups 6-15 of the periodic table or a lanthanide, (2) a pptg. agent which forms an antimonide, arsenide, chalcogenide, halide, or phosphide with the metal from 1, and (3) a bifunctional compd. which has  $\geq 1$  electron pair donor group and  $\geq 1$  group transformable by polymn. or polycondensation into an org. or inorg. network, then mixing the sol. with (4) a thermally or photochem. curable or polymerizable compd. and (5) a polymn. initiator, hydrolyzing and polycondensing the network-forming groups, and curing the material. The use of transparent composites, in the form of films or ass shaped articles, for optical elements is described.

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AN 117:14980 CA  
TI Semiconductor nanocrystals covalently bound to metal surfaces with self-assembled monolayers  
AU Colvin, V. L.; Goldstein, A. N.; Alivisatos, A. P.

CS Dep. Chem., Univ. California, Berkeley, CA, 94720, USA  
SO Journal of the American Chemical Society (1992), 114(13), 5221-30  
AB A method is described for attaching semiconductor **nanocrystals** to metal surfaces by using **self-assembled difunctional** org. monolayers as bridge compds. Three different techniques are presented. Two rely on the formation of self-assembled monolayers on **Au** and **Al** in which the exposed tail groups are thiols. When exposed to heptane solns. of Cd-rich **nanocrystals**, these free **thiols** bind the Cd and anchor it to the surface. The third technique attaches nanocrystals already coated with carboxylic acids to freshly cleaned **Al**. The nanocrystals, before deposition on the metals, were characterized by UV-visible spectroscopy, x-ray powder diffraction, resonance Raman scattering, TEM, and electron diffraction. Afterwards, the nanocrystal films were characterized by resonance Raman scattering, RBS, contact angle measurements and TEM. All techniques indicate the presence of quantum confined clusters on the metal surfaces with a coverage of ~ 0.5 monolayers. These samples represent the first step toward synthesis of an organized assembly of clusters as well as allow the first application of electron spectroscopies to be completed on this type of cluster. As an example of this, the first XPS spectra of semiconductor nanocrystals are presented.

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